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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/796,587	03/09/2004	Ahmad A. Naiini	339.7807USU	1113
7590	07/20/2005		EXAMINER	
Paul D. Greeley, Esq. Ohlandt, Greeley, Ruggiero & Perle, L.L.P. One Landmark Square, 10th Floor Stamford, CT 06901-2682			CHU, JOHN S Y	
			ART UNIT	PAPER NUMBER
			1752	

DATE MAILED: 07/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/796,587	NAINI ET AL.	
	<b>Examiner</b> John S. Chu	<b>Art Unit</b> 1752	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 30 June 2005.
- 2a) This action is **FINAL**.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-79 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) 1-11 and 60-79 is/are allowed.
- 6) Claim(s) 12-20,22,23,25,26,29-33,36-40,43,44,49-51,54 and 55 is/are rejected.
- 7) Claim(s) 21,24,27,28,34,35,41,42,45-48,52,53,56-59 is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:
1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
|  | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

This Office action is in response to the amendment filed June 30, 2005.

1. The rejection under 35 U.S.C. 102(b) as being clearly anticipated by TAKAHASHI et al (6,376,151 B1) or HAMMERSCHMIDT et al (5,376,499) is withdrawn in view of the amendment deleting the compound of formula IV wherein the photosensitive compound as disclosed in those references taught those specific diazoquinone compounds in a working example.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

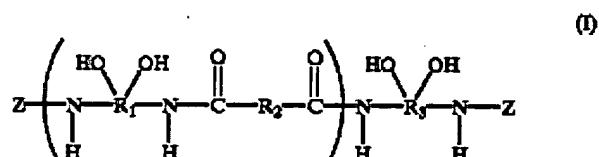
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 12-20, 22, 23, 25, 26, 29-33, 38-40, 43, 44, 49-51, 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over TAKAHASHI et al (6,376,151 B1) or HAMMERSCHMIDT et al (5,376,499) in view of HIRANO et al (6,071,666).

The claimed invention has been recited above and is included by reference.

TAKAHASHI et al discloses a positive resist composition comprising a hydroxypolyamide

**A positive resist composition comprising a hydroxypolyamide represented by the following general formula (I) and a photoactive component:**



represented by the following formula:

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wherein the hydroxypolyamide is end-capped by a group Z defined as a monovalent group and as a photoactive compound a diazoquinone compound, see column 3, line 5 - column 4, line 4 for the composition, column 6, line 20 – column 7, line 43 for the diazoquinone compound or a 1,2-naphthoquinonediazide compound and column 13, line 28 – column 14, line 68 wherein photoresist compositions are tested for viscosity stability after being stored for a week at room temperature. The endcapped groups on the hydroxypolyamide are disclosed in column 5, lines 9-65, see the image below wherein the terminating group are subjected to any of the three group disclosed: (1) sulfonating agent, (2) phthalic acid anhydride, and (3) saturated cyclic acid anhydride.

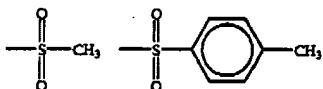
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(1) The terminal amino groups are subjected to condensation with a sulfonating agent (e.g. methanesulfonyl chloride, p-toluenesulfonyl chloride or 2-nitrobenzenesulfonyl chloride) to block the amino groups in the form of sulfonamide group.

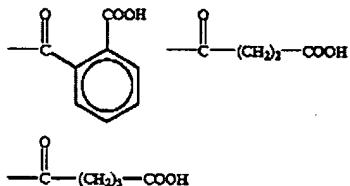
(2) The terminal amino groups are subjected to condensation with phthalic acid anhydride and/or its derivative (e.g. 4-methylphthalic acid anhydride or 4-chlorophthalic acid anhydride) to block the amino groups in the form of phthalic acid-combined amino group.

(3) The terminal amino groups are subjected to condensation with a saturated aliphatic hydrocarbon-based cyclic acid anhydride (e.g. succinic acid anhydride, 2-formamidosuccinic acid anhydride, methylsuccinic acid anhydride, 2,2-dimethylsuccinic acid anhydride, acetoxysuccinic acid anhydride, acetylmercaptosuccinic acid anhydride, glutaric acid anhydride, 3-methylglutaric acid anhydride, 2,2-dimethylglutaric acid anhydride or 3,3-dimethylglutaric acid anhydride) to block the amino groups in a state that an aliphatic acid is bonded to the polymer terminals in the form of free amidocarboxylic acid group.

Examples of the amide blocking group Z used herein are preferably the followings groups when the X of the structural formula (II) or (IV) is a sulfonyl group:



and the followings groups when the X is a carbonyl group:



The ratio of terminal blocking in the form of amide must be 40 mole % or more of the total terminal amino groups, with 60 mole % or more being preferred.

A ratio of terminal blocking in the form of amide, smaller than 40 mole % is not preferred because, when the hydroxypolyamide is formulated into a positive resist, the resist is unable to fully exhibit excellent storage stability, lithography property and cured film property which are the meritorious effects of the present invention.

Examples 1-3, columns 8, line 33 – column 9, line 41 disclose the specific end-capped groups on the hydroxypolyamide, each being Ex. 1 end-capped with methanesulfonyl chloride; Ex. 2 the same as Ex. 1 having different dicarboxylic group in the polyamide; and Ex. 3 having an end-capped group of p-toluenesulfonyl chloride.

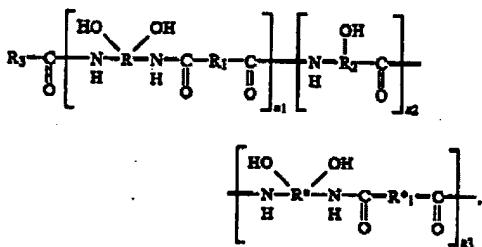
The method claims as recited in 38-40, 43 and 44 are met by the disclosure found in column 18, lines 19-39, wherein the photoresist is coated on a wafer dried at 80° C, exposed to

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light through a high pressure mercury lamp, developed and heat treated a 200° C for 30 minutes and then at 400° C for 1 hour.

The substrate is disclosed in the resultant Example 10, column 17, line 39 – column 19, line 15. The diazoquinone compound found in column 6, lines 45-47 suggest the use of these compound which are the same as recited in claim 12, formula V and thus is obvious to the skilled artisan for use in a photoresist composition as claimed.

HAMMERSCHMIDT et al discloses an end-capped hydroxypolyamide precursor, see the image below and column 2, lines 20 – 35:



the photosensitive compound is a diazoquinone compound as disclosed in column 5, lines 57-68.

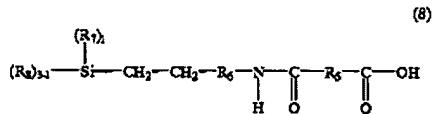
HAMMERSCHMIDT et al in column 5, lines 57-60 disclose that known quinone diazides can be used in the composition wherein the compound taught in TAKAHASHI et al provides a known phenol compound which can be esterified with a quinonediazide sulfonyl compound to give a photosensitive ingredient.

TAKAHASHI et al disclose the use of additives such as phenolic compounds, leveling agents and silane coupling agents, see column 7, lines 44-49, while HAMMERSCHMIDT et al likewise teaches the use of adhesive agents, wetting agents, or mixtures thereof for their advantageous use in manufacturing relief structures.

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Each of the references in the current rejection lacks a specific disclosure for the specific silane adhesion promoting agent as disclosed in claims 32-33.

HIRANO et al has been cited to disclose a positive photosensitive resin composition comprising a polyamide of formula (I), a photosensitive diazoquinone compound, a phenol compound and an organosilane compound (see column 4, lines 33 – et seq.) as exemplified here:



The skilled artisan is clearly motivated to use additive ingredients in order to modify and adjust the compositional properties as desired wherein the said organosilane compound specifically designed for increasing adhesion, see column 21, lines 21-33.

It would have been *prima facie* obvious to one of ordinary skill in the art of positive photosensitive resin composition comprising a polybenzoxazole precursor for semiconductor devices to add an organosilane agent as taught in HIRANO et al as an adhesion promoter and reasonably expect same or similar results as disclosed in TAKAHASHI et al and HAMMERSCHMIDT et al for having a composition with excellent mechanical properties and a high durable pattern resistance to deformation due to heat.

The arguments by applicant have been carefully considered, however the amendment fails to overcome the rejection under 35 U.S.C. 103 and the rejection is repeated.

4. Claims 21, 24, 27, 28, 34, 35, 41, 42, 45-48, 52, 53, 56-59 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

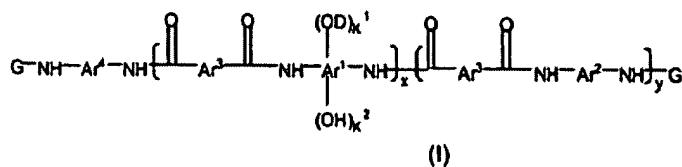
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None of the references of record disclose limitations as recited in those claims drawn to a composition having the end-capped photosensitive hydroxypolybenzoxazole precursor with a second non-polymeric photosensitive diazoquinone compound and its use in a pattern forming process on a substrate and the substrate.

5. Claims 1-11 and 60-79 are allowed.

None of the prior art references of record disclose the claimed polybenzoxazole having an end-capped group defined as "G" and having diazoquinone chemically bound at the hydroxyl groups on the polymer, see below:

**A polybenzoxazole precursor polymer with Structure I**



6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Chu whose telephone number is (571) 272-1329. The examiner can normally be reached on Monday - Friday from 9:30 am to 6:00 pm.

The fax phone number for the USPTO is (703) 872-9306. **On July 15, 2005 applicants should begin sending correspondence to the new USPTO Central fax phone number at 571-273-8300. Applicants can still use the old fax number until September 15, 2005 at which time the old fax number will no longer be operational.**

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (571) 272-1700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PMR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
John S. Chu  
Primary Examiner, Group 1700

J.Chu  
July 15, 2005